Department of Mathematics and Statistics Colloquium

Nonlocal Geometric Variational Problems: From Liquid Drops to Swarms

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Abstract: Variational principles are used to describe preferred states of many physical, biological and chemical systems from quantum mechanical models to self-assembly and collective behavior of many-particle interactions. Within the class of variational problems, geometric problems, such as finding optimal shapes of solid bodies with given physical properties or identifying area minimizing surfaces with prescribed boundary properties, have recently attracted significant interest. In particular, variational problems with nonlocal effects have been the recent focus of modern mathematical analysis. The pertinence of nonlocal models is that they introduce length scales, which then are used to investigate complex microstructures in macroscopic domains.

In my talk, I will introduce several nonlocal geometric variational problems and present on my contributions which address pattern formation induced by competing short-range attractive and long-range repulsive interactions. I will review some classical and well-established variational problems, and demonstrate how the analysis of their novel extensions enables us to gain insight into the general phenomenology of nonlocality.

Monday, April 8 at 3:50 in Roop 103

Refreshments at 3:30